NEW ORLEANS FORECAST DISTRICT

Southeast storm warnings for the Texas coast were issued on the 9th, at 8:20 p. m., because of a disturbance over the Rio Grande Valley; and winds of verifying velocity occurred after midnight. Northwest storm warnings, issued on the morning of the 24th, for the east coast of Texas, failed of verification; in this instance an area of high pressure was expected to cause strong winds but lost intensity as it extended southeastward. This warning was lowered at 8 p. m.

Small-craft warnings were issued for the Texas coast on the 1st, 3d, and 21st, and for the west coast of Texas on the 24th, and were mostly justified.

Warnings of freezing temperature in the northwestern or northern portions of the district were issued on the 2d and 3d; and warnings of frost in portions of Arkansas, Oklahoma, and north Texas were issued on the 7th, 8th, 11th, 12th, 14th, 15th, 18th, 19th, 23d, 24th, and 27th.—*R. A. Dyke.*

DENVER FORECAST DISTRICT

The month was remarkably warm in all but the extreme southeastern portion of this district, on account of low pressures being rather more persistent than usual over the Southwest and the Pacific slope during the first two weeks, and numerous widespread LOWS moving along the Canadian border during the second two, the HIGHS in the meantime drifting rapidly southeastward from Montana with diminishing intensity. Precipitation was generally below normal east of the Continental Divide and in northern Utah. In Arizona and southwestern Colorado, however, unusually stormy conditions prevailed with precipitation far above normal. No cold waves or other severe weather occurred and no warnings of that character were issued. Warnings of frost and freezing temperature, most of which were verified, were issued frequently for northern New Mexico and the western Colorado fruit valleys throughout the month and for Utah after the middle of the month. Daily advices of minimum temperatures to be expected at the fruit district key stations, Roswell and El Paso, were issued as usual, and daily temperature forecasts for the benefit of orchardists in the Gunnison Valley were furnished to the special observer at Delta, Colo., beginning on the 28th, fruit in that region having then reached the critical stage.—*E. B. Gittings, jr.*

SAN FRANCISCO FORECAST DISTRICT

At the beginning of the month a disturbance of the Plateau type caused unsettled weather throughout the far western states. This continued for several days, and rains became general in Oregon and Washington on the 2d and 3d. On the 2d a disturbance about midway between the California coast and the Hawaiian Islands showed a marked development, while the usual HIGH over the northeastern North Pacific was noticeably weakened. Consequently, the special bulletin quoted below was issued on that date, constituting the first prediction of general rains for California in 40 days. As the drought was becoming serious, this forecast was given wide and prominent notice by news agencies.

A disturbance of increasing intensity is shown by vessel weather reports to be central this morning in latitude 30° N. and longitude 145° W., and moving eastward. It will be productive of unsettled weather to be followed by general rains in the State of California the first part of the coming week. It is probable that the rains will be in amounts sufficient to materially benefit grain and other growing crops.—*E. H. Bowie.*

The storm reached the coast on Sunday, April 4, and by the morning of the 5th had covered the entire State with rain, the amounts in most cases being unusually heavy. No serious gales occurred in connection with this disturbance, but there were fresh to strong winds along the southern California coast on the night of the 4th and on the 5th. Rain continued throughout California on the 6th, when the storm had passed inland to the Plateau and Middle Rockies. Meanwhile a new disturbance had developed, and the following bulletin was issued at 10 a. m. of the 6th:

The disturbance referred to in a special bulletin issued April 2 has passed inland and this morning its center is over Utah. It has caused general and in many cases excessive rains in the State of California during the last three days. The rains were notably heavy over southern California, where the fall in instances exceeded 6 inches, while at Mount Wilson the fall was more than 9.50 inches. The heavy rains greatly relieved the drought situation in the coastal regions and valleys of northern California.

Another storm of considerable intensity has formed some distance off the California coast and it will advance eastward and bring about another period of rains over all parts of the State of California within the next 48 hours.—*E. H. Bowie.*

This storm moved onto the northern California coast during the following night and southeast storm warnings were displayed on the morning of the 7th at all seaports from Point Conception to Cape Flattery. It was an unusually severe disturbance for the season in such low latitudes, the center when off the northern California coast having pressures of about 29 inches. Moderately heavy to heavy rains ensued throughout California, with southerly gales along and off the coast. In southern California the rainfall in the mountains and in places in the lowlands was excessive. The total amount for the two storms, April 4 to 9, inclusive, was, at Los Angeles, over 7 inches, exceeding any previously recorded April rainfall at that place. Mount Wilson reported a total for the same period of 15.60 inches. Amounts in northern California were also unusually heavy, San Francisco receiving more than in any April since 1896, while April rainfall records were exceeded at numerous other places. All danger to crops from deficient moisture was removed, storage reservoirs were filled, and the enormous benefits accruing to agriculture and related industries much more than offset the relatively insignificant damage caused by floods and washouts.

Although the termination of the rainy period was anticipated in the morning forecasts of April 8, some one, doubtless a self-constituted long-range weather forecaster, announced the advent of further storms on April 9 which would affect the whole Pacific coast. As a consequence, the Los Angeles County Flood Control Committee wired the district forecast center on that date:

Newspaper reports here announce violent storm on way. Please wire collect forecast.

The following reply was sent:

No grounds for report of approaching storm. Fair weather indicated for southern California next several days.

Aside from light and local rains associated with disturbances developing or moving southward over the Plateau, no further rains occurred in California until the 17th. On the 10th an area of high pressure moving in from the Pacific Ocean began to influence the far Western States, and by the 12th and 13th produced rather warm weather in nearly all sections except the immediate coast, especially in northern California and western Washington and Oregon. Its influence lasted until the 14th.

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No frosts occurred in connection with this HIGH; warnings which were based on it were not verified. Another HIGH of similar type moved northeastward from the Pacific into British Columbia on the 22d. Warnings of local frosts in eastern Washington and eastern Oregon in this case were fully justified. Because of this pressure situation, fire-weather warnings were issued for western Oregon and western Washington well in advance of the event and anticipated a protracted and acute fire hazard which prevailed over the north Pacific States and northern Idaho until the 29th. The forecast officials at Portland and Seattle effectively amplified advices from the district center concerning the approach, continuation, and termination of this period of hazard. During its continuance, records of high April temperatures were exceeded at San Francisco, San Jose, Sacramento, Red Bluff, Spokane, and Walla Walla.—*T. R. Reed.*

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RIVERS AND FLOODS

By H. C. FRANKENFIELD

Numerous floods of short duration and moderate intensity occurred during April—particularly along the Atlantic coast, in the streams of the Great Lakes drainage area, in the Gulf drainage, and in the interior rivers of Indiana, Illinois, and Ohio. Warnings for these floods, as well as for more severe ones which occurred in the Wabash River, and the Colorado, Guadalupe, and Brazos Rivers of Texas, were timely and in the main accurately verified. Reports of losses indicated slight damage except in the few instances given below.

Houston, Tex., district.—The following note relative to the floods in this district is quoted from the report of the official in charge of the Weather Bureau Office at Houston, Tex.:

> The presence of much of moisture in the soil prior to the arrival of the locally heavy rains of the opening decade of the month and the more general and frequently excessive rains near the beginning of the last decade favored the heavy run-off which followed. The more moderate rainfall over the Brazos drainage area at Waco and above no doubt saved the lower part of that river from a great overflow, in view of the fact that this stream went to flood stage at Washington largely from the water received from the Yegua and smaller streams in that vicinity, where the precipitation was torrential; the Navasota stream carried a vast volume of water, but the flood water from this stream did not arrive at the Brazos until the crest had passed down from the junction point, thus merely delaying the natural fall of the trunk stream. The Trinity flood would have been more severe if the excessive rain within a radius of 30 or 40 miles of Riverside had been more widespread and further upstream.
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> The main losses from the high stages and floods in the several streams involved were from washed highways, injury or destruction of bridges, washing of soil, much of which had been plowed but little planted, delay in planting of crops, and suspension of business.
>
> Much labor and expense was saved in the lower sections of the Brazos River bottom lands by advisory notices from this station of probable crest stages slightly under flood, thus preventing unnecessary removal of livestock and other farm property from threatened areas. On the other hand, much livestock and other property were saved in the flooded areas by timely warnings of coming flood stages. It has been impossible to secure data covering all losses and all savings. The tables inclosed herewith give data in detail on the stages of the several rivers involved, losses, and savings.

The reported losses and savings along these rivers (Trinity, Neches, Brazos, and Sabine) were as follows:

Tangible property	$25,000
Crops	10,000
Prospective crops	20,000
Suspension of business	72,500
	127,500
Savings through Weather Bureau warnings	100,000

In addition to the above losses there was of course much damage not to be estimated in dollars and cents. The chief item of this kind was a loss of 20,000 acres of prospective crops on the Sabine. The value of the warnings also undoubtedly greatly exceeded the above figure. Farmers on both the Brazos and the Sabine reported that the warnings were responsible for saving the expense of moving to higher ground; and no estimate could be made of the value of cattle saved from the lowlands of the Sabine.

Colorado River of Texas.—Of this flood the official in charge, Weather Bureau Office at San Antonio, Tex., reports as follows:

> The Colorado River was in flood from April 22 to 24, and heavy overflows occurred from Bastrop to the Gulf. * * * The warnings received wide distribution and saved considerable property. The flood caused a money loss of around $55,000 in bridges, $20,000 damage to roads, $24,000 loss to farms and growing crops (8,000 acres flooded). Practically all livestock that ranged in the lowlands were saved by timely warnings, $4,000 in saving having been reported. Many automobiles were saved from partial injury, but no estimate in money value thus saved can be obtained.

Terre Haute, Ind., district.—The flood in the Wabash River (as in the other streams of Indiana, Ohio, and Illinois) was due to a period of heavy rain near the close of the first week and at the beginning of the second, the ground having been already saturated by rains late in March. As stated by the official in charge at Terre Haute, Ind.:

> Owing to rainfall on March 31, which averaged slightly over an inch over the Wabash watershed, the river began to rise rapidly throughout its course and the flood stage was exceeded at one station, Lafayette, Ind., on April 1. A series of showers in the upper portion of the valley on April 1 and 2 kept the soil saturated and prevented any marked decline in the river stage. Another period of rainfall, in which the average was about 2 inches, over the Wabash and White River watersheds from April 6 to 8, inclusive, caused a general flood throughout the valley. On the 11th and 12th of April moderate rainfall over the lower Wabash Valley and the White River Valley increased the magnitude and duration of the flood in the lower Wabash River.

In view of the magnitude of the Wabash flood, the losses were comparatively slight. The following figures for losses and savings are partly estimated:

Tangible property (mainly bridges, highways, etc)	$8,400
Crops	1,200
Suspension of business	5,000
	14,600
Savings through Weather Bureau warnings (estimated)	30,000

Meridian, Miss., district.—The floods in the Pearl and West Pearl Rivers resulted from moderately heavy rains over an extended period in late March. The warnings, issued well in advance of damaging stages, resulted in a saving of $5,500 in movable property in addition to much livestock, the value of which could not be estimated. Losses were reported as follows:

Tangible property	$14,700
Suspension of business	5,900

In New England and eastern New York a continuation of cool and moderately dry weather served to prevent any serious materialization of the threatening conditions noted in that section in previous issues of this REVIEW. For those floods which did occur (see table) warnings were issued whenever necessary, and the resulting losses and damage were small. The Connecticut River at Hartford, Conn., was above flood stage from 12:30 p. m., April 24, to 4 p. m., May 1, with a crest stage of 20.8 feet (4.8 feet above flood stage) at 4 p. m., April 27.